when compared with aerobic growth. He also finds no coincidence between intensity of "intramolecular" respiration and of anaerobic growth. The conclusions of these workers are drawn from too few and these mainly cultivated forms. Study of wild forms of varied habits may show very different results. —WILLIAM CROCKER.

Structure of the spore wall.—A notable addition to our knowledge of the structure and development of the spore wall is contributed by BEER[31] in a study of the young pollen grains of *Ipomea purpurea*. At the conclusion of the reduction division, the tetrads of young pollen grains become surrounded by massive mucilaginous walls, which show the reactions of callose and pectose. Within this mucilaginous wall, and surrounding each young pollen grain, is another mucilaginous wall with the same reactions. This second wall is called the "special wall," a term suggested by STRASBURGER to replace the awkward and misleading term "special mother cell wall." The exine is deposited by the pollen protoplast upon the inner surface of the special wall, and at first is homogenous, but soon becomes differentiated into an outer lamella, with a network of thickening bands on its inner surface, and at the intersection of the bands are the rudiments of the spines. At this stage a clear space is seen between the outer lamella and the thickening bands, and in this space the rodlets characteristic of the mature pollen develop. The spines project into the pollen cavity before they begin to appear externally. The intine develops within the exine as a thin layer, with thicker portions where it protrudes into the exit pores. Chemically, it consists of pectic bodies associated with some cellulose. In older pollen grains the exine consists of a delicate outer lamella perforated with countless pores, so that it really forms a reticulum with open meshes, beneath which are the thickening bands constituting the mesospore, perforated by the narrow exit pores for the pollen tubes. The outer lamella of the exine dips into the exit pores and covers the protrusions of the intine at these spots. Since nearly the entire growth of the rodlets and spines takes place after they have become separated from the protoplast, it is concluded that they are able to develop without any direct contact with the protoplasm.

This short paper presents a thorough study of a single species and suggests a series of investigations, for it may be predicted with the utmost confidence that the account will not hold for angiosperms in general, and the author makes no such claim. After various types of pollen grains have received similar attention, it will be time to generalize.—CHARLES J. CHAMBERLAIN.

Chemotaxy.—SHIBATA[32] gives the first part of a full statement of his extensive work on chemotactic responses of the spermatozoids of pteridophytes. This

[31] BEER, RUDOLF, Studies in spore development. Ann. Botany **25**:199–214. *pl. 13*. 1911.

[32] SHIBATA, K., Untersuchungen über die Chemotaxis der Pteridophyten Spermatozoiden. Jahrb. Wiss. Bot. **49**:1–60. 1911.